REMARKS

This is in response to the Office Action that was mailed on 1st April 2003. Claims 7-10 have been added. New claim 7 recites 2-8 weight-% nitrogen, based on lines 29-31 on page 7 of the specification. New claim 8 corresponds to original claim 6. New claims 9 and 10 are directed to methods of improving the balance between flame retardance and hardness when molded in semiconductor encapsulating resin compositions, based upon Table 2. No new matter is introduced by this Amendment. Claims 1-10 are in the case.

Claims 1-6 were rejected under 35 U.S.C. §103(a) as being unpatentable over US 6,190,787 (Maeda) in view of JP 10-324791 (Shiobara). Claims 1-6 were also rejected under 35 U.S.C. §103(a) as being unpatentable over Maeda in view of US 6,214,455 (Honda). The rejections are respectfully traversed.

The present invention is based not simply on incorporating nitrogen into a resin that is part of a semiconductor encapsulating resin composition, but instead upon the discovery of relative amounts of nitrogen that must be used to provide the desired flame retardant effects in the context of such compositions. A nitrogen content of less than 1.5 weight-% fails to provide the compositions with the desired flame retardant properties, while a nitrogen content in excess of 20 weight-% impedes molding of the compositions and adversely affects their moisture resistance and storage stability. Specification, page 7, lines 25-29. See also Table 2.

Thus, in accordance with the present invention, improved high-temperature capabilities and flame retardance are attained by controlling the nitrogen content to a specific amount in a composition that includes an epoxy resin, a phenolic resin curing agent, and a molybdenum compound. Even with this use of a molybdenum compound, excellent flame retardance and high-temperature capabilities are not obtained together when the nitrogen content is outside of the inventive range. This is established by Comparative Examples 1 and 2. Even if the nitrogen content is controlled to be within the inventive range, however, excellent flame retardance and high-temperature capabilities are not obtained in the absence of the molybdenum compound. This is established by the Declaration under 37 CFR 1.132 of Shoichi Osada enclosed herewith.

The Maeda reference discloses an epoxy resin composition for sealing semiconductors which does not contain any halogen compounds or antimony compounds, has excellent flame retarding properties, and shows excellent high temperature storage life and reliability in a humid condition. The Maeda composition for sealing semiconductors comprises (A) an epoxy resin, (B) a phenolic resin curing agent, (C) a curing accelerator, (D) an inorganic filler, and (E) zinc molybdate. Maeda fails to teach or suggest control of the nitrogen content. Therefore, Maeda corresponds to Comparative Example 1 in the present specification.

Shiobara discloses a fire retardant epoxy resin composition that contains (A) an epoxy resin with an epoxy equivalent of at least 185, a backbone bearing at least one structure in the molecule in which two benzene rings can conjugate directly mutually or via an aliphatic unsaturated double bond and at least 50% of the carbon atoms having SP2 type atomic orbitals, (B) a phenolic resin with a hydroxyl value of at least 160 and at least 85% of the carbon atoms having SP2 type atomic orbitals, (C) a phenolic resin with a nitrogen content of 5-20 weight-% bearing a triazine ring, and (D) at least 70 volume-% per total composition of an inorganic filler, the composition substantially not containing a bromine compound or an antimony compound.

The Honda reference discloses a halogen-free flame-retardant epoxy resin composition, comprising (A) a bisphenol A type epoxy resin, (B) a novolac type epoxy resin, (C) a phenolic resin type curing agent, (D) a curing accelerator, and (E) an inorganic filler. The phenolic resin type curing agent (C) is provided by a nitrogen-containing phenolic resin, preferably, by a co-condensation resin formed by the reaction among a phenolic compound, a guanamine, compound, and an aldehyde compound. Honda teaches that, more desirably, a phenolic resin containing both phosphorus and nitrogen should be used as the curing agent (C). Further, Honda discloses that a combination of the co-condensation resin and a reactive phosphoric acid ester can be used as a curing agent.

However, Shiobara and Honda fail to teach or suggest the use of a molybdenum compound. Accordingly, they correspond to Comparison No. 1 in the Osada Rule 132 Declaration. The unexpected superiority of the invention presently claimed to the composition representative of the prior art is readily apparent from the Declaration. It can be seen, for

instance, that the composition of Comparison No. 1 burned while the composition of Example No. 1 had a flame retardance rating of V-0.

Since the combination of references cited by the Examiner fails to teach or suggest control of the nitrogen content to the specified amount and the incorporation of a molybdenum compound ***in combination***, the effects of the present invention cannot be viewed as being expected based upon the teachings of the cited references.

Conclusion

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Richard Gallagher (Reg. No. 28,781) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By _____
Andrew D. Meikle, #32,868

RG
ADM/RG:gml
0171-0759P

P.O. Box 747
Falls Church, VA 22040-0747
(703) 205-8000

Attachment(s): Declaration of Shoichi OSADA